

AEROMEDICINE — A REGIONAL APPROACH

Aeromedical transport of seriously ill patients is no longer a rarity, but rather an everyday event.



WAYNE SMITH

BSc, MB ChB

Deputy Director

Emergency Medical Services

Provincial Government

Western Cape

Dr Wayne Smith is Head of the Special Operations Division of the Emergency Medical Services of the Western Cape. He has a particular interest in aviation medicine and currently serves as the Honorary Chief Medical Officer for the Red Cross Air Mercy Service. He is actively involved in teaching of pre-hospital medicine both at the EMS Academy and the University of Cape Town's Division of Emergency Medicine.

As early as 1784, the medical fraternity began to consider the benefits their patients might gain from being transported by air. However, it was not until 1917 that the first air ambulance took to the skies in the form of a French Dorand AR II.

Over the next few decades the aeromedical industry began to develop. The majority of development was within the military sphere in Europe and the USA. World War II saw an exponential increase in the use of aeromedical transport with an estimated one million patients being airlifted during this conflict. In the Korean and Vietnam wars in the 1950s and 1960s, the helicopter was used for the first time as a front-line medical evaluation vehicle. This brought about dramatic reductions in patient morbidity and mortality, as seen in Table I.

Table I. **Effectiveness of aeromedical transport**

Conflict	Time to care (hours)	Mortality (%)
World War I	12 - 18	8.8
World War II	6 - 12	5.8
Korea (with helicopter)	2 - 4	2.4
Vietnam (with helicopter)	1 - 1.4	1.7

This marriage of aviation and medicine, although greatly developed by the military, has readily been adopted by the civilian pre-hospital environment. Worldwide, the practice of aeromedical transport, whether for the purpose of pre-hospital casualty response or inter-facility transfer, has been recognised as a vital component in the continuum of patient care.

Unfortunately this does not necessarily hold true in the South African medical environment, where aeromedical transport is often seen as an ineffective option, particularly as it is seen as very expensive.

THE SOUTH AFRICAN REQUIREMENT

The delivery of health care in South Africa has changed dramatically over the last decade. The emphasis has been placed on primary health care, which ideally is situated closer to the community. At the same time there has been a consolidation of tertiary health services, within both the public and private health care sector.

The disease and injury profile has probably not altered that significantly over the same period of time. Trauma and violence still play a significant role in South African society, as does the ever increasing incidence of HIV/AIDS and tuberculosis.

Table II. **Medical helicopter dispatch criteria**

- A head injury with a Glasgow Coma Scale (GCS) of no less than 6 and no more than 12 out of 15
- A systolic blood pressure of 80 mmHg or less despite resuscitation
- Where signs and symptoms indicate spinal injury or where there is documented neurological fall-out and road transportation time exceeds 20 minutes
- Patients with respiratory difficulty/distress despite full oxygenation
- Any serious amputations involving long bones, or threatened limbs
- Where specialised equipment or expertise (other than routine advanced life support) carried on the aircraft is required on scene
- Severe penetrating trauma to the head, neck, thorax or abdomen with possible involvement of underlying organs or vascular structures
- Near drowning or diving incident
- Electrocutation with arrhythmia
- Hypothermia (core temperature < 35°C)
- Hyperthermia (core temperature > 40°C)
- Burns — the aircraft will not be dispatched to patients with greater than 80% burns unless other indications are present:
 - children 20 - 80%
 - adults 30 - 80%
 - burns of the face with inhalation injury
- Medical patients where the medical expertise of the crew is required, e.g. post resuscitation, unstable acute myocardial infarction, unstable arrhythmia, or where no advanced life support road transport is available within a reasonable amount of time
- Confirmed obstetric emergencies: prolapsed cord, obstructed labour etc.

These factors have placed increasing pressure on the emergency medical services, especially on their role in facilitating a rapid yet cost-effective transport network to support the referral systems.

The golden hour

Physicians often describe the 'golden hour', when the patient's life is quite literally in the hands of the doctors and pre-hospital practitioners who are in attendance. It is then that decisions must be made quickly, and questions of transport and how to best move the patient to the closest most appropriate hospital must be answered.

The best means of transport does not always mean road ambulances. Dependent on the type of response as well as the distance involved, the aeromedical model may be the most appropriate, both for patient outcome and in terms of cost effectiveness.

Appropriate dispatch and utilisation of these aeromedical resources is vital. Dispatch needs to be guided by medical criteria (Table II) as well as geographical parameters, such as distance to the incident as well as the type and condition of the available landing zone. The dispatch criteria as listed apply to a primary response by air (response to the site of an incident) rather than to an inter-facility transfer. These criteria are typically used when dispatching the medical helicopter. The dispatch of a fixed-wing aircraft is based on the same criteria to a greater or lesser degree although distance to be travelled plays a more important role in deciding whether or not to fly. For example: Beaufort West is situated approximately 500 km from Cape Town. To complete the transfer of a seriously ill patient by road from Beaufort West to Cape Town will take at least 4 hours; the flying time with the Pilatus PC12 is a mere 45 minutes.

A REGIONAL AEROMEDICAL MODEL

In the Western Cape, the provincial emergency medical services decided to embark on an extensive aeromedical programme to complement the existing road ambulances. This has been done in conjunction with the Red Cross Air Mercy Service, a non-profit organisation operating as an independent trust that has been providing aeromedical services in southern Africa since 1966.

The programme is based on the philosophy of 'the most appropriate resource for the particular requirement'.

To address the requirement, two aircraft are available on a daily basis. These aircraft are dedicated air ambulances and are typically utilised as follows and as seen in Fig. 1:

Distance to incident	Aircraft type
± 50 - 200 km radius	BO105 helicopter
± 200 - 500 km radius	Pilatus PC12 fixed wing

This model excludes particular scenarios such as mountain rescue where a rescue helicopter is used exclusively. These aircraft operate from their base at the Cape Town international airport.

The correct selection of aircraft is vital to ensure operational and cost effectiveness, keeping in mind that many of the rural areas may require a fixed-wing aircraft with short runway capability as well as the ability to safely negotiate the dirt strips commonly encountered (Fig. 2).

The appropriate utilisation has proven to be very cost effective, comparing favourably with road transportation.

A cost-effective alternative

The Board of Healthcare Funders (BHF) has set the tariff for road transportation at R22.00 per patient-carrying kilometre for an advanced life support road ambulance.



Fig. 1. Aeromedical model as utilised in the Western Cape.



Fig. 2. Rural runways require aircraft with standby undercarriage and optimal clearance.

To fly a patient with the Pilatus PC12 costs the Province R18.40 per kilometre (inclusive of medical crew and equipment) as outlined below:

✈ BHF tariff, road ALS ambulance = R22.00/km

- ✈ Pilatus PC12
- Fixed costs* = R12.00/km
- Operational costs† = R6.40/km
- R18.40/km

*Includes all costs such as landing fees and navigational fees.

†Based on a monthly utilisation of 60 hours.

This is however not a true reflection of the real savings to the health sector,

as other soft costs have not been factored in. This includes the facts that:

- road transport is often for single patients whereas the aircraft has multi-patient capability
- distance transmitted by air is significantly shorter (15 - 25%) than that travelled by road to the same destination
- scene resources such as advanced life support paramedics are not tied up for many hours during long road transfers
- patients are delivered timeously to definitive tertiary care, thereby potentially improving patient outcome.

THE WAY FORWARD

South Africa, as a developing country, faces unique health care challenges. The delivery of an efficient yet cost-effective aeromedical service is at the forefront of the attempt to address some of these challenges.

The benefit of appropriate medical transportation by air has been proven by numerous studies throughout the world. The benefit to patient care is of paramount importance, especially as regards achieving appropriate medical intervention timeously.

The vast distances that separate rural communities from tertiary medical Centres should no longer be seen as an obstacle in the delivery of appropriate health care. The outstanding challenge remains for the medical fraternity to adopt aeromedicine as an integral part of their patient care regime.

IN A NUTSHELL

Aeromedical transport is no longer a rarity but rather an everyday event.

Although initial development was under the auspices of the military a highly successful civilian model has developed.

South African medical practitioners often shy away from utilising an aeromedical service due to the perceived high financial cost of such a service.

When used appropriately the aircraft can greatly benefit patient care while at the same time costing less than equivalent road transportation.

The full range of benefits achieved still needs to be quantified.

Appropriate utilisation is based on many parameters, including medical criteria as well as distance.

South Africa is a country characterised by long distances. These distances are no longer an obstacle as regards the delivery of emergency medical services.